VOLUME 6 ISSUE 1

Journal of

Sporting Cultures and Identities

P_ac Rgk cq dmp Rp_lqeclbcp ?rfjcrcq

HM?LL? F?PNCP

COMMON GROUND

SPORTANDSOCIETY.COM

JOURNAL OF SPORTING CULTURES AND IDENTITIES
www.sportandsociety.com

First published in 2015 in Champaign, Illinois, USA
by Common Ground Publishing LLC
www.commongroundpublishing.com

ISSN: Pending

Journal of Sporting Cultures and Identities is peer-reviewed, supported by rigorous processes of criterion-referenced article ranking and qualitative commentary, ensuring that only intellectual work of the greatest substance and highest significance is published.

Race Times for Transgender Athletes

Joanna Harper, Providence Portland Medical Center, USA

Abstract: In recent years, organizations such as the International Olympic Committee have created regulations to allow those athletes who have undergone gender reassignment to compete in their chosen gender. Despite these rules, there is still a widespread belief that transgender female athletes have an inherent advantage over 46,XX female competitors. Until now, there has not been any published data, based on performances of transgender athletes, to either support or refute this belief. There are two main stumbling blocks to creating such a study: the first is to determine an appropriate metric to examine and the second is to find participants for the study. This study analyzed race times for eight transgender female runners, who have competed in distance races as both male and female, using a mathematical model called age grading. Collectively, the age graded scores for these eight runners are the same in both genders.

Keywords: Transgender, Athletes, Distance Running, Gender, Research

Introduction

Athletes have historically been divided into male and female for the purpose of most sporting competitions. Two components of biological sex, first external genitalia, and later chromosomes were used to make the determination of who was allowed to compete in women's sport. Chromosome testing was initiated for the 1968 Olympics (Elsas et al 2000, 249-254) and thereafter, only those people with XX sex chromosomes among their 23 chromosome pairs, or 46,XX females, were allowed into women's sports. Human biology, however, does not neatly divide into two categories. For instance, some people have neither a 46,XY nor a 46,XX karyotype. Additionally, some people are born with a 46,XY pattern, but with mutations which cause them to be assigned female gender at birth. Chromosome based requirements for participation in female athletics were discontinued in the 1990s (Elsas et al, 249-254), but controversy surrounding athletes with karyotypes other than 46,XX competing in women's sport continues. (Karkazis et al 2012, 3-16).

Transgender people are those whose innate sense of gender, or gender identity, does not match their biological sex. Some transgender people seek gender reassignment. Such people have been termed transsexual, and although the term is descriptive, it is now often viewed unfavorably within the transgender community. While transgender surgery can alter external and internal genitalia, and hormone therapy changes many secondary sex characteristics, neither can alter karyotype; hence it is questionable whether one could claim a change in sex as a result of any intervention. Unambiguous reassignment of gender is, however, possible.

Those who are satisfied with the gender assigned to them at birth can be described as cisgender.

Transgender athletes have sought to compete against other athletes on the basis of their reassigned gender, rather than on their biological sex. While there has been little resistance to the presence of transgender male athletes, sporting organizations were unwilling to allow transgender women to compete against 46,XX women prior to the 21st century. It is notable that in the 1970s, Rene Richards, probably the best-known transgender athlete in history, sued in the United States court system in order to be allowed to play women's tennis (Abrams 2010).

In 2004, the International Olympic Committee (IOC) enacted the Stockholm Consensus (Ljungqvist et al., 2003), that allows transgender women to compete in women's sport once a) gender reassignment surgery had been completed, b) the athlete was legally recognized as female, and c) they had undergone two years of hormone replacement therapy. Transgender men were permitted to compete against cisgender men, although transgender men must file a therapeutic use exception (TUE) form to cover their use of testosterone injections.

Journal of Sporting Cultures and Identities
Volume 6, Issue 1, 2015,www.sportandsociety.com, ISSN pending

At the time of the Stockholm Consensus, there was no published scientific literature that would justify the inclusion of transgender women. The committee that created the Stockholm consensus relied heavily on information from Dr. Louis Gooren from Amsterdam (Ljungqvist 2104). Dr. Gooren was an expert in transgender studies and would go on to co-author an important paper which studied nineteen transgender women after commencement of hormone therapy (Gooren and Bunck, 2004, 425-429). After one year of testosterone suppression, the subjects had testosterone levels below those of 46,XX women, and hemoglobin levels equal to those of 46,XX women (red blood cell content is very important in endurance sports). Muscle mass differences between the two groups were cut in half. The height of the individuals did not change. There were no additional changes noted at three years. This study was not undertaken on athletes, nor did the researchers directly measure any physical component of athleticism, such as strength, speed, explosiveness, or endurance. The authors concluded that it was reasonable to allow transgender women to compete against cisgender women after appropriate hormone therapy.

It is notable that the Stockholm consensus required two years of hormone therapy, while the published study noted that there were no physical changes in the subjects after one year. This discrepancy was due to conservative estimates given to the committee by Dr Gooren prior to the publication of his study (Ljungqvist 2014).

Many sports followed the lead of the IOC, and in subsequent years there have been transgender women competing in sports such as golf (Mianne Bagger and Lana Lawless), cycling (Natalie Van Gogh, Michelle Dumaresq, and Kristin Worley), martial arts (Nong Toom, and Fallon Fox), and basketball (Gabrielle Ludwig). None of these women has been particularly successful at the highest levels of sport after gender reassignment, and one could argue that this lack of success over ten years would be a strong indication of the fairness of permitting transgender women to compete against cisgender women.

Instead of acceptance, however, there has been a substantial amount of controversy over the presence of transgender women in female athletics. Most people contend that transgender women have an unfair advantage in women's competition (Cavanagh and Sykes, 2006). Opponents of transgender inclusion often point to physical characteristics such as height and hand size, which are not changed by gender reassignment, and suggest that transgender women will always maintain an unfair advantage over cisgender women. These arguments continue today and are not confined to competition at the highest levels. Recently, there were 10,000 emails sent in to protest the decision by the State of Minnesota to allow high school transgender athletes to compete in their chosen gender (Minnesota Star Tribune 2014).

Those in favor of allowing transgender athletic participation inevitably point to the fact that every major sporting organization to look at the issue since 2004 has agreed to allow transgender women to compete against other women. Proponents also will often suggest that science is on their side. However, the only existing published study related to transgender women in sport is the original one by Gooren and Bunk. The science supporting transgender inclusion is very thin indeed.

A thorough literature review of studies applicable to transgender athletes was undertaken for the Canadian Government (Devries, 2008). This review found that "To date no study has conducted any sort of exercise test to assess athletic performance" and concluded that there were no data indicating any sporting advantage or disadvantage for transgender women as compared to over 46,XX women.

The lack of such a study should not come as a surprise. There are two major obstacles involved in compiling any study involving transgender athletes. The first problem is how to formulate a study to create a meaningful measurement of athletic performance, both before and after testosterone suppression. No methodology has been previously devised to make meaningful measurements.

The second problem is to find study participants. There are few transgender athletes, and even fewer who will want to be identified. In order to create a study, a small cohort of competitive transgender athletes must be found in one given sport. Fortunately, there is mass participation in distance running races throughout much of world. All major cities hold road races with many thousands of runners, giving the sport a large base of adult competitors. Thus, the sport of distance running is an obvious choice to try to find suitable candidates.

In 2011, the international governing body for track and field, the IAAF, amended its rules to allow anyone who was legally and hormonally female to compete in the women's category (IAAF, 2011). The portion of the ruling applicable to transgender women lists no requirement for surgical intervention, or specific duration of hormone therapy. It does require an endocrine evaluation prior to any declaration of eligibility. In many parts of the world, legal gender reassignment is not allowed, and this will be a barrier to participation for many transgender athletes.

In 2012, the IOC also adopted a testosterone-based rule for eligibility for women's sport (IOC, 2012); however, the IOC maintained their previous rules pertaining to transgender women. Hence, it would be possible for a transgender woman to compete against other women in the IAAF sponsored 2015 world track championships, but not be eligible to do so in the IOC-sponsored 2016 Olympics.

Methods

Race times from eight transgender women runners were collected over a period of seven years and, when possible, verified. The collection process consisted of seeking out female transgender distance runners, mostly online, and then asking them to submit race times. Even in 2014 few people are open about being transgender, so the submission of race times represented a large leap of faith for the participants. When possible, race times were then verified using online services listing race results. For six of the eight runners, online checking made it possible to verify approximately half of the submitted times. Two of the subjects, runners three and four, would only participate anonymously, creating an ethical dilemma over the use of their times, versus respect their privacy.

Seven of the eight subjects experienced a substantial reduction in running speed upon transition. There are a few methods of comparing men's and women's race times. The simplest involves the well-known approximation that men will, on average, run 10% faster than women (Berman et al. 2013 63–65). There are a couple of other comparison methods as well, but there is only one method that also factors in age. Correcting for age is important because most of the runners in the study were more than 30 years old, and would be faced with declining performance as they grew older, following their gender transition.

Age grading (Grubb, 1998, 509-521) is a method of comparing the performance of athletes of all ages and both sexes. For running events, the athlete's race time (RT) is compared to the fastest time ever run by a person of that age and sex, or the age standard (AS). The resultant age grade (AG) percentage is obtained by the following formula:

$$AG (\%) = (AS \times 100) / RT$$

All times are measured in seconds.

In order to understand how age grading works, let's examine two forty-year-old runners who run a 5-kilometer race (5k). The male runner runs 19:30 (1170 seconds). In order to determine his age grade, one compares his time to the fastest time ever run by a forty-year-old male 5k runner, i.e. 13:39 (819 seconds). The equation becomes

$$AG = (819 \text{ seconds} \times 100)/1170 \text{ seconds} = 70$$

and our male runner gets a score of 70.

The female runner has a time of 21:51 (1311 seconds) and her time is compared to the fastest ever time by a forty-year-old woman, i.e. 15:18 (918 seconds). The equation for her AG is

AG = (918 seconds x 100) /1311 seconds = 70

Thus, our male and female runners score the same age grade despite the fact that the male ran more than two minutes faster than the female did. This is fair. Men run faster than women. The two runners are both well above average runners for their age and sex, and deserve to receive equal accolades.

Age grading has become the standard way of comparing performances by older track and field athletes of both sexes. The method has also been rigorously evaluated and improved, specifically with regard to the curve fitting that is needed to connect the age standards associated with different ages. Mathematician Alan Jones (Jones 2010) has made significant improvements to the age-graded tables that Howard Grubb developed in the 1990s.

Results

Collectively, the eight runners had much slower race times in the female gender than as males. Time differences were, in fact, so great, that age graded performances stayed virtually constant for the group. Tables one through four summarize the data from all eight runners over four frequently run race distances varying from 5k to the marathon (42 kilometers). Not all eight women submitted times for all four of these distances.

Table 1: 5k Race Times

	Male	**Races**		**Female**	**Races**	
Runner No.	**Age**	**Time**	**AG**	**Age**	**Time**	**AG**
One	48	18:27	78.7	52	22:43	75.7
Two	30	15:56	81.4	36	17:51	82
Four (a)	30	17:35	73.6	33	21:04	70.6
Five	34	19:39	66.7	35	23:43	63
Six (b)	24	15:07	83.5	53	20:22	85.5
Eight	27	20:29	62.2	30	22:51	64.8

Table 2: 10k Race Times

	Male	**Races**		**Female**	**Races**	
Runner No.	**Age**	**Time**	**AG**	**Age**	**Time**	**AG**
One	49	0:39:05	77.9	56	0:48:45	76.1
Two (b)	22	0:32:37	82.4	36	0:36:58	83.1
Five	34	0:45:33	60.1	36	0:57:40	53.3
Six (a)	46	0:37:10	80	48	0:42:01	80.5

Table 3: Half-marathon Race Times

	Male	**Races**		**Female**	**Races**	
Runner No.	**Age**	**Time**	**AG**	**Age**	**Time**	**AG**
Five	33	1:53:06	52.4	37	2:05:38	53.3
Six (b) (d)	26	1:08:38	86.3	53	1:32:27	83.8
Six (a) (d)	46	1:23:11	77.8	48	1:34:01	77.5
Seven (c)	19	1:48:47	55.7	28	1:48:45	60.5

Table 4: Marathon Race Times

	Male	Races		Female	Races	
Runner No.	**Age**	**Time**	**AG**	**Age**	**Time**	**AG**
Three	49	3:18:58	69.5	54	4:12:31	67.2
Five	34	3:16:59	63.4	35	4:08:33	55.3
Seven (c)	19	3:49:55	55.7	31	2:59:10	75.7
Eight	29	3:08:53	66.1	30	3:44:55	60.2

Notes

(a) These races were run over the same course within three years' time and represent the best comparison points.
(b) Races compared over a long time period have more uncertainty associated with them, but both runner two and runner six reported stable training patterns over this time range. These races also help to confirm the age-grading methodology for tracking progress of a runner over the course of a multi-year time frame.
(c) Runner seven represented the biggest evaluation challenge. She raced as a 19 year-old male recreational runner and then resumed running years later as a female. She got serious about the sport after she resumed, doubled her training load and dropped 10 kg of weight. Not surprisingly, she got faster. This improvement can be seen in the fact that her AG went from 60.5 at age 28 to 75.7 at age 31 (both in female gender). This 15 point change in age grade was much larger than the 5-point change she experienced after transition from male to female.
(d) It is useful to compare times for the same runner over different race courses and at different time periods. The two lower scores occurred on a hilly course at a period of average fitness for runner six. The two higher scores were on flat courses at times of peak fitness.

Table five indicates the average AGs from all eight runners in each gender and the overall averages of all eight.

Table six shows the highest AGs from each runner and the average of these highest AGs. Two tailed t tests were run on both the mean and peak AGs. The p values were p=0.84 for the average AGs and p=0.68 for the highest AG. A p value of less than 0.05 is needed for the values to be considered significantly different, and these p values are very much higher.

Table 5: Average Age Grades

	Average male AG	Average female AG
Runner 1	75.2	77.1
Runner 2	81.8	82.8
Runner 3	69.5	70.8
Runner 4	71.4	64.8
Runner 5	57.7	49.3
Runner 6	83.8	81.9
Runner 7	55.7	61.9 (e)
Runner 8	54.3	59.1
Average	68.7	68.5

Table 6: Highest Age Grade

	Highest male AG	Highest female AG
Runner 1	78.7	79.2
Runner 2	82.9	83.2
Runner 3	69.5	74.3
Runner 4	74.1	74.1
Runner 5	66.7	63.0
Runner 6	87.5	85.6
Runner 7	55.7	63.4 (e)
Runner 8	66.1	64.8
Average	72.7	73.4

(e) The 2:59 marathon time by runner seven was considered an outlier, the result of her substantially altered training and was not used in these tables.

Discussion

The majority of scientists believe that testosterone is primarily responsible for the difference in athletic results between the sexes (Bermon et al. 2014, 4328–4335), although there are dissenters (Healy et al. 2014, 294-303). There have been multiple studies on men's and women's testosterone levels with some variation in results, but a typical set of values would be as follows: Men's range — 10 to 35 nmol/l; female range — 0.35 to 2.0 nmol/l (Haring et al. 2012, 408–415).

Transgender women who have undertaken testosterone suppression change from normal male testosterone levels to normal female levels, in fact, after surgery their testosterone levels are below the mean for 46,XX women (Gooren and Bunck, 425–429). Largely as a result of their vastly reduced testosterone levels, transgender women lose strength, speed, and virtually every other component of athletic ability.

Since this study looks at endurance capabilities of athletes both pre and post testosterone suppression, it is also of significant interest to look at hematocrit or hemoglobin levels of transgender women. One year after testosterone suppression, hemoglobin levels in transgender women fell from 9.3 mmol/l to 8.0 mmol/l. This latter number is statistically identical to the mean hemoglobin level for cisgender women (Gooren and Bunck 425–429).

The reduction of testosterone and hemoglobin levels of transgender women after transition would suggest that endurance capabilities of transgender women athletes should be similar to those of 46,XX women.

The difficulty of finding suitable subjects is underscored by the fact that it took seven years to amass data from eight participants.

The times submitted by the eight runners were self-selected and self-reported. The self-reporting by the subjects certainly affects the strength of the findings. As mentioned previously, almost half of the race times were double checked by the author for accuracy. None of the subjects incorrectly reported any result.

Collectively, the eight runners were much slower in the female gender; slow enough, in fact, that their age graded performances were almost identical to their male AGs. Two of the runners had higher average AGs in male gender than in female gender, while one runner had higher female AGs than male ones. The changes in the age grades of these runners mirrored changes in their training habits.

After transition, runner four began to experience a significant number of injuries which prevented her from training as rigorously as she previously had. It is not surprising that her results got worse as time went on. Runner five experienced both weight gain and a loss motivation in the years after her transition. In fact her motivation declined to the point that she gave up racing not long after the submission of her results.

On the other hand, runner seven blossomed as a runner after transition. Eventually, she doubled her weekly training distance. She also lost approximately 10 kg of body mass after she started to train harder. It is not surprising that her times and age grade scores showed a subsequent improvement.

The other runners in the study reported relatively stable training loads in both male and female mode, and this is reflected in their more stable age grades in both genders.

Since training loads vary over time for all runners, the author believes that highest age grade might be the best comparison of male versus female athletic potential. But, whether one uses average or highest age grades, the subjects scored statistically identical age grades both as male and as female.

It is significant to note that none of the eight subjects was a truly elite runner. An optimal study would use world-class runners and the results could be used to justify the presence of transgender women in events such as the Olympic Games. Unfortunately, there simply are no world-class transgender distance runners. Three of the eight runners have achieved notable success at the national level, and two of the other runners could be described as sub-elite. Resistance to the presence of transgender women occurs at all levels of sport, and so there is still much merit to the study.

One interesting trend was noted in runners five, six and eight, who age graded higher in shorter events as women than they did in longer events. Runners six and eight scored higher age grades in 5k races than they did as males but lower AGs in longer races – half marathon and up. Runner five scored lower across the board as female than as male but her 5k AGs were much closer to her male ones, than her marathon AGs were. Transgender women carry more muscle mass than 46,XX women (Gooren and Bunck 2004, 425–429). This extra muscle mass might cause increased speed when compared to cisgender women, and hence faster times and higher AGs at shorter distances. Increased muscle mass and heavier bones are not conducive to long distance running, and would actually be a disadvantage when running distances of a half marathon and higher, causing slower times and lower AGs. This effect is small in the three mentioned runners, and none of the other five runners submitted data over a wide enough range of distances to determine whether or not this pattern held true for them; more research would be needed to confirm or refute the hypothesis of distance related variations in age grade scores for transgender women.

It should be noted that these results are only valid for distance running. Transgender women are taller and larger, on average, than 46,XX women (Gooren and Bunck, 2004, 425-429), and these differences probably would result in performance advantages in events in which height and strength are obvious precursors to success - events such as the shot put and the high jump. Conversely, transgender women will probably have a notable disadvantage in sports such as gymnastics, where greater size is an impediment to optimal performance.

The Grubb and Jones age-grading methodology applies only to track-and-field and distance running, but, it should be possible to create a similar analytic method to compare results for other sports, such as swimming, weightlifting, or ski-jumping, which also measure results in times, distances or weights – the so called CGS (centimeter, grams, and seconds) sports. It would be very difficult, however, to devise such a method to analyze performances in most other types of sports.

Conclusions

Despite the fact that transgender women have been allowed to compete against cisgender ones since 2004, there has been no study used to justify this decision beyond the original work of Gooren and Bunck. It bears repeating that this original study was not undertaken on athletes, nor did it directly measure any aspect of athleticism. In fact, this is the first time a study has been developed to measure the performance of transgender athletes. The author overcame two significant barriers which have prevented any previous study from being performed, i.e. the difficulty in determining an appropriate metric to measure athletic performance both before and after testosterone suppression, and the difficulty in finding enough willing study participants in any given sport.

The author chose to use the standard age-grading methodology which is commonly used in master's (over forty) track meets worldwide, to evaluate the performance of eight distance runners who had undergone gender transition from male to female. As a group, the eight study participants had remarkably similar age grade scores in both male and female gender, making it possible to state that transgender women run distance races at approximately the same level, for their respective gender, both before and after gender transition.

It should be noted that this conclusion only applies to distance running and the author makes no claims as to the equality of performances, pre and post gender transition, in any other sport. As such, the study cannot, unequivocally, state that it is fair to allow to transgender women to compete against 46,XX women in all sports, although the study does make a powerful statement in favor of such a position.

It should also probably be noted that the publication of this study will likely not appreciably change the resistance faced by transgender women who compete against cisgender ones. There will continue to be strong opposition by athletes, parents and fans to the inclusion of transgender women. It will take many more years before the average sports enthusiast understands that transgender women who have undergone testosterone suppression will not dominate women's sports.

REFERENCES

Abrams, Roger I. "*Sports justice: the law and the business of sports* Boston, Mass".: Northeastern University Press, 2010

Bermon, S., Garnier, P.Y., Hirschberg, A.L., et al. 2014. "Serum Androgen Levels in Elite Female Athletes." J Clin Endocrinol Metab. Nov;99(11):4328-35.

Cavanagh, S.L., & Sykes, H. 2006. "Transsexual bodies at the Olympics: The International Olympic Committee's policy on transsexual athletes at the 2004 Athens Summer Games". *Body & Society, 12*, 75-102.

Devries, M. 2008. "Do Transitioned Athletes Compete at an Advantage or Disadvantage as compared with Physically Born Men and Women": A review of the Scientific Literature

Elsas LJ, Ljungqvist A, Ferguson-Smith MA, et al. 2000. "Gender verification of female athletes." Genet Med;2:249–54

Gooren L**,** and Bunck M. 2004. "Transsexuals and competitive sports." *European Journal of Endocrinology* 151: 425-429.

Grubb, H.J. 1998. "Models for Comparing Athletic Performances". The Statistician, 47, 509-521.

Haring, R., A. Hannemann, U. John, et al. 2012. "Age-specific reference ranges for serum testosterone and androstenedione concentrations in women measured by liquid chromatography–tandem mass spectrometry." *Journal of Clinical Endocrinology and Metabolism* 97(2): 408–415.

Healy, M.L., Gibney, R., Pentecost, C., Wheeler, M.J., and Sonksen, P. H. 2014 "Endocrine profiles in 693 elite athletes in the post competition setting." Clin Endocrinol (Oxf). Aug;81(2):294-305.

International Association of Athletics Federations 2011. "IAAF Regulations Governing Eligibility of Athletes who have Undergone Sex Reassignment to Compete in Women's Competition"

International Olympic Committee 2012. “IOC Regulations on Female Hyperandrogenism”. www.olympic.org/Documents/Commissions_PDFfiles/Medical_commission/2012-06-22-IOC-Regulations-on-Female-Hyperandrogenism-eng.pdf

Jones, Alan. 2010. “Age Grading Running Races”. http://home.roadrunner.com/~alanjones/AgeGrade.html

Karkazis, K., R. Jordan-Young, G. Davis, and S. Camporesi. 2012. “Out of bounds? A critique of the new policies on hyperandrogenism in elite female athletes.” American Journal of Bioethics 12(7): 3–16.

Ljungqvist, A., Cohen-Haguenauer , O., Genel, M., Simpson, J., Ritzen, M., Fellous, M., Schamasch 2003. “Statement of the Stockholm consensus on sex reassignment in sports.” www.olympic.org/Documents/Reports/EN/en_report_905.pdf

Ljungqvist, A., 2014. Private Communication. *Minnesota Star Tribune* http://www.startribune.com/opinion/commentaries/284678481.html

ABOUT THE AUTHOR

Joanna Harper: Medical Physicist, Radiation Oncology, Providence Portland Medical Center, Portland, Oregon, USA

Journal of Sporting Culture and Identities is one of the four thematically focused journals that support the Sport and Society knowledge community—its journal collection, book series, and online community.

The journal focuses on sport's motivations, meanings and purposes. It publishes articles that examine the psychology of sport and the interplay between individual identities and access, equity, and participation in sports.

Journal of Sporting Culture and Identities is a peer-reviewed scholarly journal.

ISSN Pending

ISBN 000-0-00000-000-0

00000

0 000000 000000